The present invention relates to a semiconductor device, in which an electrical connection between electrodes on a semiconductor chip and inner leads of a lead frame is provided and an electrical connection between outer leads of the lead frame and wiring patterns on a print circuit board is provided, and its manufacturing method, and more particularly to a semiconductor device wherein a distance between electrodes on the semiconductor chip to provide the electrical connection and a distance between the inner leads of the lead frame and a distance between the outer leads thereof are minute, and its manufacturing method.

When the semiconductor device is manufactured, there are numerous portions where an electrical connection is to be provided such as a portion between an electrical pad on a semiconductor chip and an inner lead of a lead frame, and a portion between an outer lead of the lead frame and a wiring pattern on a print circuit board.

Conventionally, for example, the electrical connection between the electrode pad on the semiconductor chip and the inner lead is made by a metal bonding such as a wire bonding using AU wire or Al wire, a TAB (Tape Automated Bonding) method, an ohmic contact such as a metal contact between a bump electrode on a flip chip and a lead, and the like.

Regarding the connection by the wiring bonding, the shortest distance between adjacent wires is restricted by the outer shape of a bonding capillary to be used. Due to this, it is difficult to reduce the distance between the pads on the semiconductor chip to be about 100 µm.

Moreover, in order to connect an Au ball or an Al wire to an aluminum pad on the semiconductor chip, it is necessary to apply a physical load such as heating, pressing, ultrasonic vibration. Therefore, damage is often applied to the semiconductor chip itself under the electrode pad.

In a case where TAB system or the flip chip is used, it is necessary to metal-connect Au bump or plating bump to the inner lead. Due to this, the temperature of the above case often increases higher than that of the wire bonding connection, so that a physical damage due to pressure remains. In this case, the distance between the pads can be reduced to about 80 µm, however, there is a limitation in the reduction of the bump size because of the use of the metal connection. Moreover, a large number of portions are connected at the same time. Due to this, as the number of portions to be connected is increased more, it is more difficult to obtain a stable connection in view of the height of th bump, and the condition of th connection. Due to this, it is required that the process conditions be stabilized.

The above-mentioned problem occurs in not only the electrical connection between the pad on the semiconductor chip or the bump and the inner lead but also the electrical connection between the outer lead and the wiring pattern on the print circuit board.

An object of the present invention is to provide a semiconductor device, in which the distances between portions to be electrically connected can be reduced more than the conventional case and high reliance can be obtained without applying physical damages due to heating, pressurizing when the electrical connection is made, and its manufacturing method.

According to the present invention, there is provided a semiconductor device comprising a lead frame formed of a conductive material, a semiconductor chip having a plurality of electrodes on its surface, and a connect section where the lead frame is electrically connected to the plurality of electrodes on the semiconductor chip by a metal plating.

Moreover, according to the present invention, there is provided a semiconductor device comprising an insulating film, a wiring pattern formed on the insulating film, a semiconductor chip having a plurality of electrodes on its surface, and a connect section where the end surface of the wiring pattern is electrically connected to the plurality of electrodes on the semiconductor chip by a metal plating.

Furthermore, according to the present invention, there is provided a semiconductor device comprising a lead frame to which a semiconductor chip is connected, a wiring board having a wiring pattern on its surface, and a connect section where the lead frame is electrically connected to the wiring pattern on the wiring substrate by a metal plating.

Furthermore, according to the present invention, there is provided a semiconductor device comprising a lead frame formed of a conductive material, a semiconductor chip having an electrode on its surface, a first connect section where the lead frame is electrically connected to an electrode on the semiconductor chip by a conductive adhesive, and a second connect section where the lead frame is electrically connected to the electrode on the semiconductor chip by a metal plating to cover the surroundings of the first connect section.

Also, according to the present invention, there is provided a manufacturing method of a semiconductor device comprising the steps of moving a lead frame formed of a conductive material and an electrode formed on a surface of a semiconductor chip to be close to each other and adhering the semiconductor chip to the lead frame, and immersing the lead frame and the semiconductor chip in